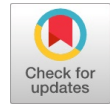


Product Marketability of an All-terrain Vehicle in the Indian Context



Vinay Sharma, Shiva Prasad H.C.

Abstract: An All-terrain vehicle (ATV) is a product used in the fields of motorsport, tourism, agriculture, and defense. It is a better-perceived product in Europe, North America, and South America. Although the scope for use is extensive in the Indian subcontinent, the ATV market is still underdeveloped. The purpose of this paper is to probe into the perception of current and future potential customers for an All-terrain vehicle in India and understanding the reason for the low number of units sold and provide a perspective on the overall performance of the ATV as a product. It also briefly discusses the parameters for the ATV to enter the field of agriculture in India and suggests a method to convert the market from underdeveloped to emerging market potential. Data is acquired using a questionnaire survey and with the prediction model, it proves that the segment is a niche and has a sale prospect for growth with changing economic scenarios in India

Keywords: About four key words or phrases in alphabetical order, separated by commas.

I. INTRODUCTION

An All-terrain vehicle (ATV), is a vehicle that operates and runs on a wider variety of terrains than normal vehicles. It is three or four-wheeled and has handlebars or wheels for steering purposes [1]. It is a special purpose vehicle and requires permits to be driven around. The permission being acquired, there ought to be easily accessible zones in a preferable range of the individual so that the ATV may be driven based on the purpose of buying it, which can vary from recreational activities, motorsport to agricultural purposes. Customer behavior pattern is an important parameter for a product such as the ATV since it is amongst a certain set of luxuries and leisure. Again, the perspective of a potential buyer changes towards any product with changing circumstances in terms of finances. It is observable human tendency to react to the same situation in a different way under different circumstances. As numerous market researches indicate, the ATV is a better perceived and performing product in other parts of the world because of the suitable, easily accessible terrains and a larger variety of ATVs in terms of the features and the price range. If an All-terrain vehicle is to be developed into a prosperous product into the Indian market, the manufacturers need to graduate the product into other fields where the ATV finds a better use.

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The ATV is used as a substitute for tractors in the field of agriculture. In India, though, ATVs do not qualify to be used as a tractor. If customer demographics are observed, the North American continent is a big consumer of All-terrain vehicles. A study conducted in 2014 revealed that 68.7% of Indians lived on less than 2 per day. The international poverty line stands at \$1.25 per day. Hence, a majority of India falls at the bottom of the economic pyramid (BOP) [2]. Therefore, for the Indian market, the price range is the single most important factor that decides upon the performance of a certain product. In the Indian context, these price ranges are high for ATVs since there is No dedicated indigenous manufacturing. Customer engagement is the first step towards mapping customer behavior. Survey questionnaires are an effective method of engaging customers and understanding their perspective on the product range from various feature and price aspects. Customers are also eager to take the survey depending on their experience quality from the product [3]. Data collected through external surveys is abstract, and further analysis is a necessity to reveal the weight carried by each factor. Over a brief period, data analysis and mining have gradually had an increment in impact over the decision making in an organization [7]. The authorities may then try and take a decision that either considers the single-most important parameter or one that satisfies the whole lot. Data mining is used in the pre-processing of certain data sets with the help of machine learning algorithms and statistical methods [9]. Data mining on external survey responses and its subsequent results play a pivotal role in the design of a product, as the results draw light on the features that the current, and target customers desire. Marketing and product development teams use mined data for the design and promotion of these new products [7]. The purpose of this paper is to investigate the perspective of a small sample group on the All-terrain vehicle as a product (the individuals chosen are way above the Gross national income of India: \$1790 in 2017. If the product is found to be expensive by this group, it will obviously be unaffordable for a group of people with a lower range of income) [15]. The target, through this investigation, is to spot some basic parameters, process them and draw a relation between them which will help the readers have a better insight into the current scenario of the Indian ATV market. Market reports by companies such as GM insights and Statesman have sales figures for each region, but the reasons behind those figures are not specified. This paper attempts to put forth those various reasons and factors behind the low ATV sales in India.

II. LITERATURE REVIEW

Human behavior is always based on the circumstances the individual faces.



A choice made under a certain condition may not remain the same when certain other parameters are introduced into the scenario [4]. Product sales are a direct indication of customers' behavior pattern under various conditions.

When asked about a certain product, a choice is made on whether to rent or buy the product, but if a budget is set on the product, the individual will always compare it against other products, which may or may not be of the same segment. An individual reacts differently to different appraisals of the same situation. Interpretation of the same context may change with the introduction or variance of a new, or already existing factor [19]. North America and Western Europe are markets that have reported a high sale of all-terrain vehicles over the years and have showcased a steady growth as well. The sport utility ATV segment alone in 2016 had a volume of 76,273 units. North America is expected to account for a majority share of the ATV market by 2024 [6]. India and China are expected to emerge as markets with a rise in the use of ATVs in the defense sector [6]. A developed market is a region where the customer base and the target market are already accustomed to the pricing models of the segment [13]. An emerging market is a region where the customer base and target market are partly accustomed to the pricing models within the segment. However, the product cannot penetrate to its potential in such a market. A frontier market is a region where the targeted customer base is not accustomed to the pricing model at all [13]. India is currently a frontier market for ATVs but can soon enter the emerging markets segment with the help of extensive use of ATVs in the defense sector and a pricing model, that the targeted customer base gets accustomed to. Products that are not of indigenous manufacture have several other parameters that contribute towards their high prices such as added import duties and additional transportation costs. No leading manufacturer of ATVs has any manufacturing based in India. The Indian government has permitted local manufacturing of ATVs way back in 2014 [8]. But since then, as the market volume has shown no exponential increment (not more than 2000 units/year), companies have found it unnecessary to dedicate a manufacturing plant to this region. Dedicating on will lead to the companies incurring losses as the market may not be able to generate enough revenue to earn a respectable profit.

As the segment is small in terms of the volume, ATVs are imported in the Completely Knocked Down (CKD- Fully built up items are disassembled into smaller components and a kit is formed which is transported and is reassembled post transit) [5] format and are assembled at mini-assembly plants in India. Polaris, as the major market share holder within the ATV segment in India, started importing the product in CKD format and assembled them in the country [10]. This further raises the price of the product as the import duty incurred is added to the base price of the product. A higher price of the product drives away a major part of the potential buyers. As the ATV does not qualify to be used as a tractor in India, that segment of the customers has already withdrawn its interest in the product. It also denies the product a major advantage it had over its competitors, as the ATV is lighter compared to tractors, gives a better fuel efficiency and is easier to maintain. Pricing models can only be explored when a product is revolutionary in nature. An aggressive penetration pricing strategy may lead to a loss in probable revenues and profit. Higher selling prices will lower unit sales. Revolutionary products create a niche for themselves within the market. Hence their pricing models can be varied based

on customer response. Evolutionary products are upgraded and enhanced, hence, every upgrade can be launched with an incremented revised price with justification. Products that have a significant growth in sales have evolved versions with justifiable prices. Me-too products are launched by a company to prevent its competitors from dominating the entire market share in that segment [11]. Since the pricing model of that segment is known, the company will launch the product with an equivalent or a lower price. If a product is unable to perform in a region with a prospect, it has clearly been subject to a higher pricing model, whether it be revolutionary, evolutionary or a me-too product. If there are very few suppliers of a certain product, each with a different design offering different features, the product will still be classified as a revolutionary product. ATV is a similar revolutionary product. With only 2-3 major competitors, products of whom are easily distinguishable based on their flagship features, the pricing models can be revised depending upon the customer response. In the Indian context, the prices need to shift towards the lower end to attract more of the potential market. CKDs have an imported duty of 25-30% levied on them [12]. This factor is a major contributor to the rise of the prices. It also increases the lead time for the customers, as companies in most cases import these units in bulk. Hence, if the knocked down kit is not available, the customer must wait up till the next batch is imported. With so many concerns on the manufacturer's side for setting up the appropriate pricing model, customer behavior is the single most important parameter under consideration. For mapping, this behavior, collection of data is extremely essential for analyzing customer preferences of product, their idea, and perception of the product and the ideal price range, which they find is worthy for the product. When an organization surveys individual outside the company, the survey is known as an external survey. A response rate of 10-15% is satisfactory for an external survey. Any figure above is healthy and even more beneficial for better data analysis [14].

III. METHODOLOGY

Data Collection

Data was collected through an external internet survey questionnaire [16]. Google forms were used as the platform for developing the questionnaire. Various social media platforms were used to collect data from the sample group. All android devices have the user login with a google account prior to usage. Google forms were found as the most efficient platform for maintaining the integrity of the survey, as it allows the user to fill out the survey questionnaire only once. Editing the response was allowed on the respondent's side. Each question had multiple choice as the mode of responding. To develop the questionnaire, research was undertaken for the price range of some of the leading brand of All-terrain vehicle manufacturers in India. Polaris is one and their price range was taken as a reference model. The target for the number of respondents was set between the 500-600 range (initial participants were individuals that were known to the authors' and these individuals were further asked to circulate the survey link). The complete set of responses were recorded in two stages.



The first stage of the data collection was completed after the number of respondents touched 350. The responses were then extracted in a Microsoft Excel spreadsheet and were refined for verifying whether all the respondents had completed the entire survey. The non-respondents and responses that were incomplete were neglected from being considered for the analysis. Responses were used as parameters for further narrowing down the data. This was essential for observing the trend in responses to analyzing their consistency. This refined and analyzed data was then used to further draw out inferences from them and understand the perspective of the respondents towards the All-terrain vehicle as a product. The values acquired through the analysis of the first stage of data collection required a validation. As a part of the validation, the survey was again allowed to accept responses to achieve the pre-set target of a number of responses. The survey was completed by 165 more individuals and the acceptance of responses was again discontinued when the number of total respondents reached 515. Out of these 515, 509 responses were extracted in a Microsoft Excel sheet and analyzed keeping the responses as conditions applying the “counties” function.

Orange Canvas data mining software was used for further analyzing and interpreting the data acquired after the 2nd stage. It is a freeware with several in-built data mining, machine learning, and interpretation algorithms and modes. 3 algorithms were chosen for study and comparison: - Naïve Bayes, Neural networks, and classification tree. The excel sheet with all the tabulated responses was used to train all the learners. As the data set is rather large, the ‘k-fold cross validation’ mode of sampling was observed to give better accuracy than ‘random sampling’.

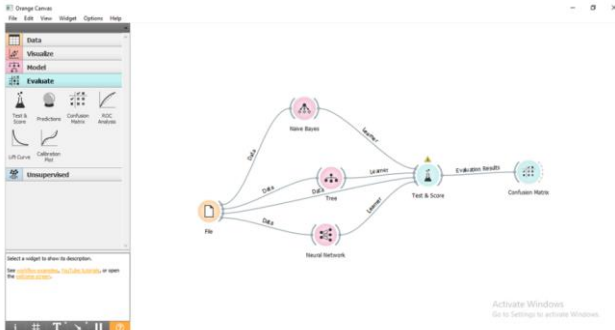


Fig. 1. Testing the accuracies of algorithms

The data was fed into the 3 chosen learners. Training the learners takes a span of a few seconds to minutes depending on the data size. The classification accuracy for all the 3 models was compared using the ‘test and score’ feature. The one with the highest CA (classification accuracy) coefficient was the most accurate model. For verifying if the right mode of sampling was being used, CAs for both the cross-validation and the random sampling were compared. ‘Confusion matrix’ was used to verify the results obtained from the test. This feature provides us with statistics based on our target for prediction.

Method	AUC	CA	F1	Precision	Recall
Tree	0.603	0.665	0.793	0.690	0.933
Neural Network	0.615	0.661	0.788	0.691	0.916
Naive Bayes	0.628	0.687	0.814	0.689	0.994

Fig. 2. Classification accuracies of all the algorithms

After the validation, the data was passed through the data sampler feature, and again the Naïve Bayes and the Neural network were trained through the sampled data. The data sampler was set into the ‘k-fold cross validation’ mode. The number of folds was set to 10, which means, that the data was being divided into 10 subsamples.

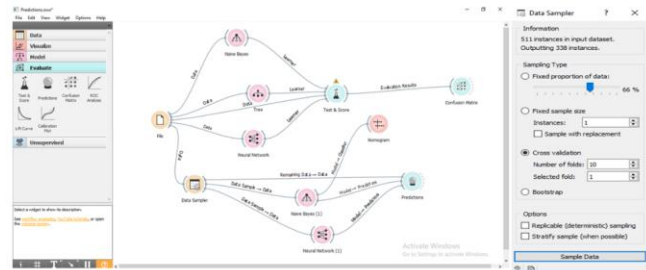


Fig. 3. Sampling the data and sending the output to algorithms and predictions

The ‘Predictions’ feature was used to create a prediction model and test the learner’s accuracy. Remaining data from the sampler and the outputs from the learning models were fed into the prediction model. The prediction model gives out outputs in the form of probabilities for the possible choices, and then the final anticipated answer.

The Naïve Bayes learner was also plugged into a ‘Nomogram’. A nomogram is a feature in which individual parameters can be varied and their effect on the final target probability can be observed. The target for the Nomogram was set to ‘Buy the ATV/Rent the ATV’ for one case and was set to ‘Buy the ATV for motorsport, leisure or other purposes/A car that is perfect for the commute of the family’ for another.

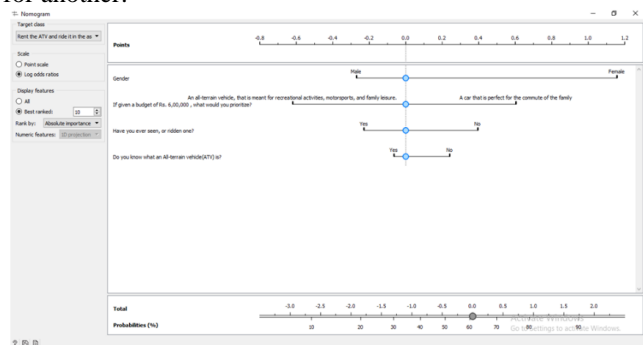


Fig. 4. Nomogram for renting/buying the ATV

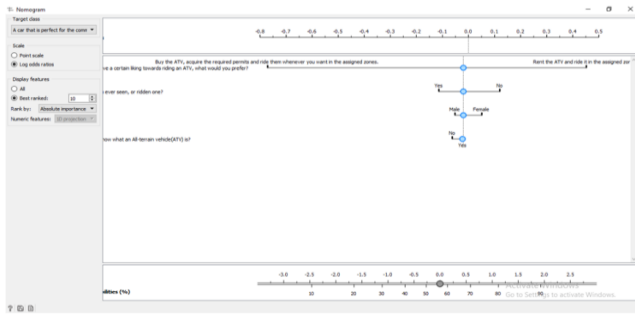


Fig. 5. Nomogram for buying the car/buying the ATV in the given budget

The parameters were varied in accordance with the target, and the probabilities for both the cases were observed. The parameter that had a larger effect on the probabilities was also deduced. The percentages from the survey were used for further inferences on customer behavior and prospect. A tolerance of 5% was pre-set between the results of the 2 stages was set for the response to be pronounced to be consistent. The average percentage of both the response stages was considered for drawing final inferences and conclusions.

A. Participants

The locations of participants were widely spread across India. The participants were from all backgrounds, namely Science, arts and commerce. Varying age group is required since it was observed that there was a difference in the psychology of the working and the non-working class. However, the age was not kept as a part of the questionnaire since it was not an angle to probe the objective at hand. The total sample group was decided to be of 1800 individuals approximately. All these individuals did have access to social media or other digital forms of communication necessarily since the survey was collected through these digital means. All the participants were economically sound. Income levels of these individuals or within their households were well over that of the middle class.

B. Assessments and Measures

An important stat for the survey is the response rate. The response rate is calculated as the ratio of the number of respondents divided by the number of individuals in the sample group. The average response rate for external surveys is 10-15%. The sample group chosen has been segmented only based on age. Therefore, any response rate over the average will be considered satisfactory.

Gender. Gender demographics are an essential parameter of all external surveys. Surveys are external when respondents are individuals outside the organization (usually probable customers or related individuals). Gender-based demographics help us to further analyze the choice opting tendency of the respondents.

Familiarity with the topic (product) of the survey. Although the sample group has been segmented cautiously, the survey might not appeal to the respondent. Hence the respondents are questioned whether they know what an All-Terrain Vehicle (ATV) is.

Whether the respondent has had any experience with the product in question. This parameter is important for further segregating the sample group under observation. If the respondents have ridden the ATV, seen it, or have had any other kind of interaction with it, they will be in a better position to answer the questions which follow in the survey.

The responses also are further analyzed keeping this as a condition: Individuals who know what an ATV is and have also ridden it or seen it.

Whether the respondent chooses to rent it or buy it. This is the penultimate factor in analyzing the responses. It provides us with an indication of an important and deciding tendency of the respondent. The respondents can presume that they have a liking towards the ATV, and asked whether they will buy the ATV, and ride it whenever they want to after acquiring the permits, or they can rent it whenever they want to ride or use it for any other purposes. It indicates whether the respondents tend to rent the product or buy it.

Whether the respondents would prefer the ATV over the other product provided they have enough funds for both. This is the final question of the survey. It asks the respondents to presume that they have Rs. 6,00,000 (roughly \$8525.149 – gross national income in India was \$1790 in 2017) [15] and asked whether they would still buy an All-terrain vehicle which is meant for motorsports, leisure, and recreational activities, or a car, that is perfect for the commute of the family. The responses provide us with an insight into whether the respondents who chose to buy the ATV over renting it went ahead and bought it. It is also a demonstration of the circumstantial decision making of human beings. Respondents who have chosen to rent the ATV, possibly will go ahead and buy it if they have a budget of Rs. 6,00,000.

IV. RESULTS

The Prior to observing and analyzing the responses, the response rate for the survey was calculated. Over 2 stages of data collection, 515 individuals out of 1800 of the sample responded to the survey. The response rate of the survey is 28.6%. This response rate is very healthy for external surveys, who have an average response rate of 10-15%.

A. A. Outcome 1

At the completion of stage one, a total of 350 responses were recorded on the survey. Out of the 350 responses, 6-7 were non-respondents or incomplete surveys and were neglected from the analysis. The final excel spreadsheet for the first stage consisted of 350 responses. 344 responses were used for analysis through the counties function. Each response was used as an input to form a correlation between the responses and map the tendency of the respondents. The results of the survey per question were as follows (Google forms): -

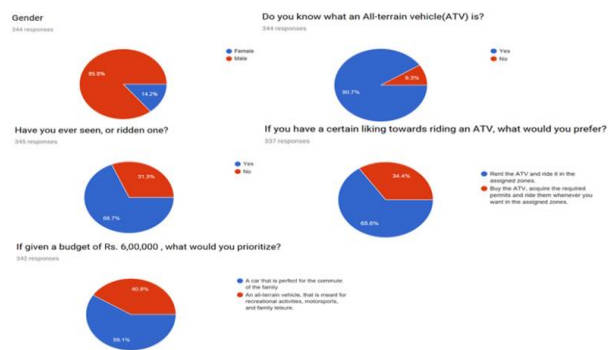


Fig. 6. Pie charts for Outcome 1 (Google forms)



B. Outcome 2

For the validation of the data analysis of stage one, response acceptance was resumed. 165 more responses were recorded, and then the combined responses were again considered for analysis. The total number of respondents was 515 now. The number of non-respondents was zero in the next 165 responses. 509 responses were again analyzed in the excel sheet.

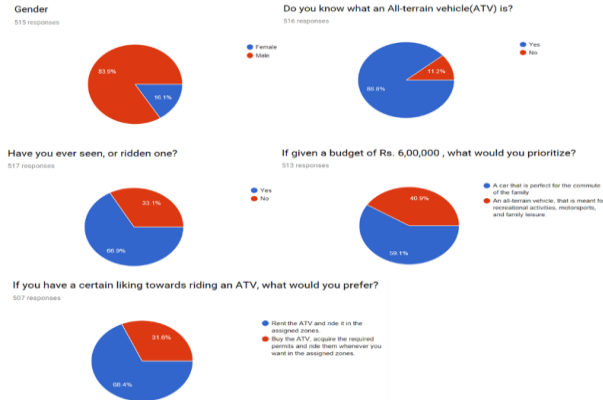


Fig. 7. Pie charts for Outcome 2 (Google forms)

Table- I: Response Analysis-Stage 1

Method	Classification Accuracy Coefficient (CA)	
	10-fold cross validation	Random sampling
Tree	0.665	0.659
Neural Network	0.673	0.664
Naive Bayes	0.687	0.678

Table 2 - Response Analysis-Stage 2

Gender	Number of respondents	Respondents who knew what an ATV was	Respondents who knew what an ATV was and have driven or seen it	Respondents who would buy the ATV in the given budget
Male	295	276	213	49 (16.6% of total male respondents)
Female	40	35	20	4 (8.16% of total female respondents)

A total of 64 respondents, who had previously opted to buy the ATV, finally went ahead and opted to buy it again with the budget given to them, i.e. 12.5%. 217 (42.6%) respondents who knew what an ATV was had chosen to rent it.

The initial part for the analysis of the data in Orange Canvas was comparing the different learning models on their accuracy. The sampling methods were also compared to the accuracy acquired by the models.

The results from the comparison are as follows: -

Below are the results acquired when the target was set to 'Buy the ATV/Rent the ATV'

Table- III: Comparison of accuracy-a

Gender	Number of respondents	Respondents who knew what an ATV was	Respondents who knew what an ATV was and have driven or seen it	Respondents who would buy the ATV in the given budget
Male	429	396	302	60 (13.9% of total male respondents)
Female	80	56	29	4 (5.0% of total female respondents)

Naïve Bayes method achieved the highest accuracy with both the sampling methods. Classification accuracy was found 68.7% with the 10-fold cross validation sampling method. Following are the results acquired when the target was set to 'An ATV meant for motorsport, leisure or other activities/A car that is perfect for the commute of the family.'

Table- IV: Comparison of accuracy-b

Method	Classification Accuracy Coefficient (CA)	
	10-fold cross-validation	Random sampling
Tree	0.613	0.605
Neural Network	0.613	0.604
Naive Bayes	0.621	0.616

Results from various targets and options offered by the nomogram are as follows: -

Target: - An ATV that is perfect for motorsports, leisure, and other desired purposes

Table- V: Results from Nomogram-A

Parameters	Do you know what an All-terrain vehicle is?	Have you ever seen or ridden one?	Buy the ATV/Rent the ATV	Probability
Male	Yes	Yes	Buy the ATV	65%
	Yes	No	Buy the ATV	59%
	Yes	Yes	Rent the ATV	35%
	Yes	No	Rent the ATV	26%
Female	Yes	Yes	Buy the ATV	63%
	Yes	No	Buy the ATV	57%
	Yes	Yes	Rent the ATV	32%
	Yes	No	Rent the ATV	28%



Both male and female individuals, who know what an all-terrain vehicle is, have seen or ridden one and would buy the ATV instead of renting it, have similar probabilities of 65% and 63% of buying an ATV in the given budget. A female respondent, who has not seen or ridden one, and would rent it instead of buying it, has a higher probability (28%) of buying an ATV in the given budget than a male individual under the same scenario (26%).

Target: - A car that is perfect for the commute of the family

Table- VI: Results from Nomogram-B

Parameters	Do you know what an All-terrain vehicle is?	Have you ever seen or ridden one?	Buy the ATV/Rent the ATV	Probability
Male	Yes	Yes	Buy the ATV	35%
	Yes	No	Buy the ATV	41%
	Yes	Yes	Rent the ATV	65%
	Yes	No	Rent the ATV	70%
Female	Yes	Yes	Buy the ATV	37%
	Yes	No	Buy the ATV	43%
	Yes	Yes	Rent the ATV	67%
	Yes	No	Rent the ATV	72%

Both male and female individuals, who know what an all-terrain vehicle is, have never seen or ridden one and would rent the ATV instead of buying it, have similar probabilities of 70% and 72% of buying a car instead of an ATV in the given budget. A female respondent, who has seen or ridden one, and would buy it instead of renting it, has a higher probability (37%) of buying an ATV in the given budget than a male individual under the same scenario (35%).

Target: - Buy the ATV instead of renting it

Table- VII: Results from Nomogram-C

Parameters	Do you know what an All-terrain vehicle is?	Have you ever seen or ridden one?	If given a budget of Rs 6,00,000, what will you prefer?	Probability
Male	Yes	Yes	ATV	67%
	Yes	No	ATV	52%
	Yes	Yes	Car	39%
	Yes	No	Car	26%
Female	Yes	Yes	ATV	33%
	Yes	No	ATV	21%
	Yes	Yes	Car	13%
	Yes	No	Car	6%

Target: - Rent the ATV instead of buying it

Table- VIII: Results from Nomogram-D

Parameters	Do you know what an All-terrain vehicle is?	Have you ever seen or ridden one?	If given a budget of Rs 6,00,000, what will you prefer?	Probability
Male	Yes	Yes	ATV	33%
	Yes	No	ATV	47%
	Yes	Yes	Car	62%
	Yes	No	Car	75%
Female	Yes	Yes	ATV	67%
	Yes	No	ATV	79%
	Yes	Yes	Car	87%
	Yes	No	Car	93%

V. DISCUSSIONS

Expecting consistent percentages for both the response sets is irrational. As the tolerance was pre-set, upon comparison, the maximum difference was found in the percentages of females who knew what an ATV was and had seen or driven it (4.6%). This value is also well within the tolerance range along with the other percentages as well. All the results were consistent. As the survey was completed by a sample group which was economically sound and had a fair knowledge about the ATV as a product 14% of the respondents opting to buy the ATV is a figure which indicates towards a high probability for growth. 67% of respondents opted to rent the ATV which is an indication towards a tendency to rent any product within the sample group which is meant for temporary use.

From a detailed analysis through the Orange Canvas data mining software, more insightful conclusions are drawn on concerns such as the appropriate learning algorithm and the correct sampling method for the data. The Naïve Bayes learner coupled with a 10-fold cross validation sampling method was found to give the highest accuracy in both the cases. It provided an accuracy of 68.7% while predicting a rather less complicated decision of having to buy or rent the ATV. But when the learner was trained to make a prediction of having to buy the ATV or a car in the given budget, the accuracy was found to have reduced to 62.1%. While the accuracy of over 60% is satisfactory in any case, the reduction in accuracy of 6.6% indicates towards the complexity of the choices, and the numerous parameters that affect them.

For relevant comparisons, probabilities are only calculated for respondents, who know what an All-terrain vehicle is. Knowing the product, a customer can decide whether it's a temporary or a permanent necessity. This is where 'Buy the ATV/Rent the ATV' comes into the picture. A respondent who chooses to buy the product instead of renting it, may not buy the product finally when a budget is set and vice-a-versa. In a sample group with a sound economic background, all the individuals owned a car and had an option to own multiple. A male respondent who would buy an ATV over renting it had a 65% probability of finally opting to buy it with the given budget. A 35% probability still exists in the same case, backing a chance that the individual might opt to buy a car. This high probability clearly indicates the prospect for the ATV industry in the Indian subcontinent.



A female respondent who knows what an ATV was, had seen or ridden it and would buy an ATV over the car in a given budget, still had a 67% chance of renting the product. A male respondent under the same conditions had a 33% chance of renting the ATV. This indicates, that the ATV is seen largely as a product for temporary usage. Another insight that is provided through this stat, is the larger tendency of women towards renting a product over men. A male who knew what an ATV was, had seen or ridden it and would buy a car in the given budget, had a 62% chance of renting the product when required. A female respondent in the same scenario had an 87% chance. On average, the individual has a 74.5% chance of renting the ATV. This verifies the approach taken by organizations like Polaris of creating an 'Experience zone' where the customers can rent and experience riding the ATV at set tariff rates. Individuals who knew what an ATV was, had seen or ridden it and would rent the ATV instead of buying it, had a 66% probability on average, of buying a car in the given budget. Individuals who knew what an ATV was, had never seen or ridden it and would buy a car in the given budget, had an 84% chance of wanting to rent it. This indicates, that the individuals had a strong desire to experience a ride or were rather inquisitive about the product. All the stats and parameters indicate a prospect market, only if the product were to be offered in the right price range. The individuals who took the survey either had or were from families with a strong financial background who can easily afford buying an ATV. A 67% chance still points out that despite being able to afford and having a knack for the product there will still be a hesitation in buying the ATV because of its high price range with respect to the Indian market. All these respondents have opted for the ATV as a means of leisure and recreational activities. If the product were to enter the farming sector, it would be an option for individuals with a much lesser income [15]. Along with that, the price ranges of the ATV must be comparable to that of tractors if not lesser. The prices can only be reduced by the manufacturers if the unit is completely manufactured in India, which is not the case right now. Most leading manufacturers prefer getting the unit in CKD form, and then assemble the product within assembly plants. This approach is justified as the ATV segment has not grown enough to demand a full-scale dedicated manufacturing plant for the subcontinental country and may not do so in a foreseeable future. An immediate solution for this is promoting a commercial grade design of the BAJA buggies designed for BAJA SAE competitions [19]. Once the ATV is permitted to be used instead of a tractor in India, these designs should be commercially manufactured and sold, as, during their testing and competitions, they prove their effectiveness for farming applications. They are light in weight, cheap, easy to maintain, and offer a better fuel efficiency than tractors. Even if the manufacture cannot be done indigenously, for the initial stage, the manufacturers must make a reduction in the profit margin, and lower the prices, so that more of the potential market chooses the ATV and there is a rise in demand. As there is a rise in demand and sales, the manufacturers will have more customer feedback and data to analyse from, which will inform them about other different features, the target market desires in an ATV. Based on an aggregate of these feedbacks, and then considering the manufacturing and incorporating costs of various features, the manufacturers may choose on what feature to incorporate and forgo or standby the others. This feature can be incorporated in the

next iteration of the ATV and may be launched as a different variant of the same ATV. Variants that are better than the basic version have an increment on their price. Hence, the ATV will change from a revolutionary product into an evolutionary product. The development of this promising segment within the subcontinental market will easily take about a decade and maybe more. During this tenure, the manufacturers can expect the Indian government to allow the usage of ATVs in the field of agriculture, and probably qualify it to be used as a tractor as well. This will add up another set of the potential customer base. The manufacturers may now have higher inbound revenue and profit from the subcontinental market, compared to the earlier scenario.

VI. CONCLUSIONS

The amount of data collected is satisfactory for detailed analysis with a good amount of accuracy to it. The Naïve Bayes learner gives out the highest accuracy amongst the 3 learners. The *k-fold cross validation* method of sampling provided the best accuracy in terms of predictions, over *random sampling*.

The All-terrain vehicle is a product that has a wide range of applications in many fields in India. A respectable percent of the sample group opted to buy the ATV but would not buy it under the given budget range. A high percentage of the individuals who had never experienced riding the ATV showcasing a desire to rent it when required shows the tourism industry can incorporate it to a larger extent for adventurous activities. The ATV as a product, and as a segment, needs further refinement in terms of the price range. The manufacturers need to focus more on indigenous manufacturing to minimize production costs and maximize the revenues and profits. If the manufacturers are successful in turning this revolutionary product into an evolutionary product, the Indian ATV market will also turn from underdeveloped to emerging. The segment can further widen once the Indian government allows the use of ATVs instead of the traditional tractors currently put in use.

VII. FUTURE SCOPE AND APPLICATIONS

Organizations and commercial manufacturers of All-terrain vehicles may use this method for segregating and targeting the right segments and target market. Understanding the customer base is of utmost importance, as they indicate towards the parameter, that affects the customer behavior the most. Organizations that draw insight from this paper on indigenous organization, can also promote indigenous designs. For this, they may keep an eye on collegiate design competitions such as Mahindra BAJA SAE India [18] which have events such as the cost report, the winner for which has manufactured the most cost-efficient car. The competition is organized by SAE India, the Indian chapter of Society of automotive engineers [17]. The competition has both combustion and electrical variants designed by student teams participating. Promoting the students at these competitions, their designs might be optimized for commercial manufacture, which will serve the purpose of a lower selling price. A lower selling price by a standard brand will surely see a growth spurt in the ATV segment in the Indian subcontinent.



Most ATV manufacturers have on-going R&Ds on electrical variants of the current combustion models. Introducing them into the market will be of a huge benefit, as it will further push them in favor with the Indian government's environmentally friendly policies. The unit sale can also be expected to exponentially grow if a cheap electrical variant is launched.

VIII. LIMITATIONS OF RESEARCH

The participants in the survey are individuals that have access to the internet. This is one of the most significant limitations of the research. Hence, it is possible, that a wider range of individuals in a sample group might yield a different result. Paid market research has sales and revenue figures but often does not include the reasons behind the low sales of a certain region. A region with low sales often does not demand any related research. This statement can be verified by the observation that a high number of research papers are available that cover issues related to the ATVs in the United States, Europe, and Australia and Oceania but closed to none can be found related to the subcontinental countries, which ironically cover closed to 1/7th of the world's population. A higher population should have ideally generated a lot of research topics. The factors behind these low sales can hence only be witnessed by staying in proximity with the All-terrain vehicle industry of India. One of the authors has been a part of a student off-roading team and hence has been in contact with the Indian off-roading industry. The authors have thus tried and described the scenario of the market to the best of the abilities and integrity. Hence, some statements that have been asserted are not from peer-reviewed research papers but have been stated based on accumulated experience.

REFERENCES

- Shulruf B, Balemi A. Risk and preventive factors for fatalities in All-terrain vehicles accidents in New Zealand. *Accident Analysis and prevention* (2010). Available: <https://doi.org/10.1016/j.aap.2009.10.007>
- Kumkum B, Sharma V, Agarwal R & Sengar A. Marketer's Mindset: Key to develop bottom of the pyramid market. *Procedia – Social and behavioural sciences* (2014). Available: <https://doi.org/10.1016/j.sbspro.2014.04.182>
- Jesu C.F., Gao L, Melcero I, Sese F. What drives customers' active participation in the online channel? Customer equity, experience quality and relationship proneness. *Electronic commerce Research and applications* (2019). Available: <https://doi.org/10.1016/j.elerap.2019.100855>
- Clark, C E. (2016). Circumstances determine human behaviour more than character or personality. *Owlcation*. Available: <https://owlcation.com/social-sciences/Situation-psychology-circumstances-determine-behavior>
- Fang D, Spicher K. Study on (Re-) designing CKD processes of automotive supply chain. *American society of Civil engineers* (2012). Available: <https://dx.doi.org/10.1061/9780784412602.0165>.
- Verma, V and Agarwal, A. (2018). All-Terrain Vehicle (ATV) Market Size By Product (Sport ATV, Sport Utility ATV, Utility ATV, Youth ATV), By Application (Sports, Entertainment, Agriculture, Military & Défense, Forestry), Regional Outlook (U.S., Canada, Germany, UK, France, Russia, China, India, Japan, Australia, Brazil, Mexico, KSA, UAE), Growth Potential, Price Trend, Competitive Market Share & Forecast, 2017 – 2024. *Global Market Insights*. Available: <https://www.gminsights.com/industry-analysis/all-terrain-vehicle-atv-market>
- Vercellis. Carlo. *Business Intelligence: Data mining and optimization for decision making*: John Wiley & Sons, Ltd, (2009).
- Gohil, P. (2014). Indian Government allows local production of ATVs. *Motorbeam*. Available: <https://www.motorbeam.com/indian-government-allows-local-production-of-atvs/>

- Vadim K. Overview of different approaches to solving problems of data mining. *Procedia – Computer science* (2018). Available: <https://doi.org/10.1016/j.procs.2018.01.036>.
- Khan, N. (2016). Polaris slashes ATV prices by half as import from China begins. *Economic times*. Available: <https://auto.economictimes.indiatimes.com/news/automotive/off-high-way/polaris-sees-atv-volume-doubling-with-its-chinese-import/52868844>
- Mam, Michael V., Eric V. Roegner, and Craig C. Zawada. "Pricing new products." *McKinsey Quarterly* 3 (2003): 40-49.
- Siam India. (2019). Customs and import duties - 2019. *Siam India*. Available: <http://www.siamindia.com/economic-affairs.aspx?mpgid=16&pgid1=18&pgidtrail=20>
- Piñeiro-Chousa J, Vizcaíno-González M & Caby J. Financial development and standardized reporting: A comparison among developed, emerging, and frontier markets. *Journal of Business research* (2018). Available: <https://doi.org/10.1016/j.jbusres.2018.12.012>
- Fryrear, A. (2015). What's a good survey response rate? *Surveygizmo*. Available: <https://www.surveygizmo.com/resources/blog/survey-response-rates/>
- World Bank (2017). Gross National income – 2017. *World Bank data*. Available: <https://data.worldbank.org/country/india>
- Deutskens E, Ruyter K, Wetzel M & Oosterveld P. Response rate and response quality of internet-based surveys: An experimental study. *Marketing letters* (2004). Available: doi.org/10.1023/B:MARK.0000021968.86465.00
- Society of Automotive engineers – SAE (2019). Available: <https://www.sae.org/attend/student-events>
- BAJA SAEIndia (2019). Available: <http://www.bajasaehindia.org/>
- Siemer, M., Mauss, I., & Gross, J. J. (2007). Same situation--different emotions: how appraisals shape our emotions. *Emotion*, 7(3), 592.

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